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Remarks: General

The disclosure has been amended to add a short description of new Figures 13A, 13B and 14.

The claims have been amended by rewriting Claims 1, 7, 12, 13, 28, 56, 58 and 60-68. No new matter is added by these amendments. Support in the specification for the recitation in Claims 1, 12, 13 and 60-68 of a step of attaching particles may be found on page 6 at lines 3-7.

The amendments to Claims 7, 28, 56 and 58 are not related to patentability inasmuch as they are made solely for the purpose of correcting typographical errors or providing better syntax and grammatical expression.

A petition under 37 CFR §1.136 for a two-month extension of time to respond the Examiner's action is enclosed, the fee for which should be charged to Deposit Account No. 04-1928 (E.I. du Pont de Nemours and Company).

If any fee other than or in addition to that mentioned specifically above is required to authorize or obtain consideration of this response, please charge such fee to Deposit Account No. 04-1928.

Claims 1-17, 24-39 and 54-82 remain active in the application. Applicant hereby requests reconsideration and further examination of the application in view of the reasons it has set forth below for the allowability of the claims.

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Remarks: Detailed Action

I.

In Items 2~6, the Examiner has objected to Claims 7, 28, 60 and 82 in view of specified informalities. Claims 7, 28 and 60 have been amended in respect of the noted informalities. As noted in the paper previously filed by Applicant, Claim 82 was copied from U.S. 6,436,221 for the purpose of provoking an interference therewith. Claim 82 corresponds to Claim 1 of the '221 patent, and follows the wording thereof, which was issued by the U.S.P.T.O.

In view of Applicant's correction of the informalities discussed above in Claims 7, 28 and 60, Applicant requests the Examiner to withdraw his objection to Claims 7, 28, 60 and 82.

II.

In Items 7~9, the Examiner has objected to the drawings, and has requested that the structural relationship between the graphene platelets and the fiber axis be shown, and that the process for improving an electron field emitter be shown.

Applicant has submitted Figures 13A and 13B to show the structural relationship between the graphene platelets and the fiber axis, and has submitted Figure 14 to show an embodiment of the process of Claim 82.

In view of the submission of Figures 13A, 13B and 14, Applicant requests the Examiner to withdraw his objection to the drawings.

III.

In Items 11~20, the Examiner has rejected Claims 1~4, 13~15, 24~26, 29~32, 34~36, 38, 54, 60~70, 76 and 81 under 35 U.S.C. §102(e) as being anticipated by US 6,097,138 ("Nakamoto").

Nakamoto discloses a field emission cold-cathode device containing a support member and an emitter arranged on the support member to emit electrons wherein the emitter is a fullerene or a carbon nanotube ("CNT").

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III(a).

In one method for making such a device, as described at 9/6~32 of Nakamoto, a CNT layer is formed by depositing carbon on a collecting member. The CNT layer sticking to the collecting member is then pressed against a synthetic resin layer ("SRL") in a molten state. After the SRL is dried to form a support substrate, the collecting member is removed from the CNT layer, and the CNT layer is transferred from the collecting member onto the support substrate. A conductive material layer is then formed on the support substrate, a resist is coated, and the CNT layer and the conductive material layer are patterned in accordance with an emitter layout.

Although Nakamoto does in this embodiment place the SRL in contact with CNTs, Nakamoto does so to transfer CNTs from a collecting member to a precursor for a substrate. Nakamoto does not disclose the use of the collecting member as an electron field emitter ("EFE") in this particular embodiment. To the extent, however, that the collecting member might actually serve as an EFE while it has CNTs deposited thereon, the CNTs are nevertheless removed by transfer to the SRL. After that has occurred, it is the SRL that has the capacity to function as an EFE because of the presence of CNTs.

By transferring the CNTs from the collecting member to the SRL, the method of Nakamoto involves a fundamentally different step than is required by any of Claims 1~4, 13~15, 24~26, 29~32, 34~36, 38, 54, 60~70, 76 and 81. All of those claims require that as a result of the operative step of the process, whether it involves an adhesive contact or applying a force, there be formed a new surface of the EFE. In Nakamoto, by contrast, the CNTs are transferred from the collecting member to the SRL, and it is the SRL that is further processed to become a field emission cold cathode device.

To the extent that the collecting member might serve as an EFE before the CNTs are transferred to the SRL, the collecting member loses that capability once the CNTs are transferred to the SRL. Nakamoto is not teaching that a new surface of an EFE is formed on the collecting member since the transfer process eliminates whatever capability the collecting member might have once had to function as an EFE. Correspondingly, Nakamoto is not teaching that a new surface of an EFE is formed on the SRL as a result of forming an adhesive contact or applying a force because the SRL has no ability to

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function as an EFE until the transfer step itself has been performed, and CNTs have become located thereon for the first time. The method of Nakamoto thus does not form a new surface of an EFE on either the collecting member or the SRL as a result of the transferal of CNTs from the collecting member to the SRL.

Stated another way, what Nakamoto discloses is the transferal of CNTs from a first surface to a second surface as a step in a process of the further fabrication of the second surface. For Nakamoto to have any bearing on the novelty of Claims 1-4, 13-15, 24-26, 29-32, 34-36, 38, 54, 60-70, 76 and 81, it would have to teach the formation of a new surface of an EFE as to the first surface since that is the surface to which the adhesive effect of the SRL is applied. A disclosure of the transferal of CNTs from a first surface to a second is not the same as the teaching of the formation of a new surface of an EFE as to the first surface. Nakamoto is silent about any further description of the collecting member after the transferal of the CNTs to the SRL, and any assumptions made about the condition of the collecting member after transferal of the CNTs would involve unwarranted speculation.

In addition to the failure of Nakamoto to teach the formation of a new surface of an EFE as to the collecting member, it is noted that the independent claims now require a step of attaching particles of an acicular emitting substance to a substrate to form the EFE. This requires that the means of attachment must withstand and maintain its integrity under conditions of manufacturing and conditions of use. In disclosing the collection of CNTs on the collecting member for eventual transfer to the SRL, Nakamoto has not taught this type of attachment since any type of firm attachment that would retard the transfer process would be inconsistent with the purpose of contacting the SRL with the collecting member in the first place.

The Examiner has stated that there is in Nakamoto a teaching of the steps of
contacting a material that forms an adhesive contact where
there is no translational motion with respect to the EFE,
the removal of a portion of an EFE,
forming a new surface of an EFE, and
fracturing an EFE.

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Applicant respectfully submits that Nakamoto does not contain a teaching of any of the above listed steps.

Nakamoto thus does not teach or suggest (i) the claimed process in which a material forms an adhesive contact with an electron field emitter, (ii) the claimed process in which a force is applied essentially normal to an electron field emitter, or (iii) an article characterized by improved emission as a result of either of those processes.

In contacting the SRL with CNTs for the purpose of transferring the CNTs off of the collecting member, Nakamoto shows no appreciation for the possibility of applying the SRL to an EFE that will remain an EFE after the application of the SRL. A new surface for an EFE is not formed by this phase of the method of Nakamoto because the CNTs are transferred off of the collecting member to the SRL, and the collecting member thereby loses whatever functionality it might have had as an EFE, but the SRL only gains functionality as an EFE by reason of that very step.

III(b).

At 11/55 ~ 12/8, Nakamoto further discloses a process in which an insulating layer is formed on the surface of an emitter, and a resist layer is then formed on the surface and is patterned such that the insulating layer is exposed at portions where gate electrodes are to be formed. A gate electrode layer is formed on the surface, and the resist layer is then removed by lift off together with unnecessary portions of the gate electrode layer.

This portion of Nakamoto does not teach or suggest (i) the claimed process in which a material forms an adhesive contact with an electron field emitter, (ii) the claimed process in which a force is applied essentially normal to an electron field emitter, or (iii) an article characterized by improved emission as a result of either of those processes. Lift off is typically a wet method in which a solvent is applied to dissolve the resist, taking away any film on top if it as well. The use of lift-off thus does not teach or suggest the subject matter of Claims 1~4, 13~15, 24~26, 29~32, 34~36, 38, 54, 60~70, 76 and 81 because it does not involve making an adhesive contact or applying a force.

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In view of the distinctions as discussed above between Nakamoto and the subject matter of Claims 1~4, 13~15, 24~26, 29~32, 34~36, 38, 54, 60~70, 76 and 81, Applicant respectfully requests that the Examiner withdraw the rejection of those claims under 35 U.S.C. §102(e).

IV.

In Items 21~28, the Examiner has rejected Claims 5, 6, 16, 17, 27, 33, 37, 39, 71 and 72 under 35 U.S.C. §103(a) as being unpatentable over Nakamoto in view of U.S. Patent No. 6,277,318 ("Bower").

As noted in Applicant's previously filed paper, Applicant submits that there is no motivation for the artisan to combine the teachings of Bower with Nakamoto.

In any event, no claims are rendered unpatentable by Nakamoto even if read in view of Bower because, as set forth above, Nakamoto itself does not teach or suggest (i) the claimed process in which a material forms an adhesive contact with an electron field emitter, (ii) the claimed process in which a force is applied essentially normal to an electron field emitter, or (iii) an article characterized by improved emission as a result of either of those processes.

Bower's disclosure of single wall CNTs adds nothing to overcome the above stated deficiencies of Nakamoto because Bower does not teach or suggest the specific process steps that distinguish Claims 5, 6, 16, 17, 27, 33, 37, 39, 71 and 72 over Nakamoto. In addition, Applicant respectfully submits that Bower's disclosure of single wall CNTs does not support an allegation of the equivalence single wall and multi-wall CNTs.

In view of the distinctions between the pending claims and the disclosures of Nakamoto, Bower and a combination thereof, Applicant respectfully requests the Examiner to withdraw the 35 U.S.C. §103(a) rejection of Claims 5, 6, 16, 17, 27, 33, 37, 39, 71 and 72 over Nakamoto, Bower or a combination thereof.

V.

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In Items 29~33, the Examiner has rejected Claims 8~11 under 35 U.S.C. §103(a) as being unpatentable over Nakamoto in view of Bower and U.S. Patent No. 6,146,230 ("Kim").

No claims are rendered unpatentable by Nakamoto when read in view of Bower and Kim because, as set forth above, Nakamoto itself does not teach or suggest the claimed process in which a material forms an adhesive contact with an electron field emitter; and Bower's disclosure of single wall CNTs adds nothing to overcome these deficiencies of Nakamoto.

Kim adds nothing to overcome the deficiencies of Nakamoto and Bower because it discloses nothing but amounts of emitting material in an electron field emitter composition, and does not teach or suggest the specific process steps that distinguish Claims 8~11 over the other references.

In view of the distinctions discussed above between Claims 8~11 and the disclosures of Nakamoto, Bower and Kim, Applicant respectfully requests the Examiner to withdraw the rejection of those claims under 35 U.S.C. §103(a).

VI.

In Items 34~36, the Examiner has rejected Claim 75 under 35 U.S.C. §103(a) as being unpatentable over Nakamoto in view of Kim. Claim 75 is distinguishable over the combination of Nakamoto and Kim for the same reasons as set forth in Section V (above), and Applicant therefore respectfully requests the Examiner to withdraw the rejection of Claim 75 under 35 U.S.C. §103(a).

VII.

In Items 37~41, the Examiner has rejected Claims 7 and 28 under 35 U.S.C. §103(a) as being unpatentable over Nakamoto in view of U.S. Patent No. 5,618,875 ("Baker").

Baker discloses a composite structure comprised of carbon filaments contained in a matrix material, and, as such, Applicant submits that there would be no motivation for the artisan to combine Nakamoto with Baker because Baker lies in a non-analogous field.

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In any event, no claims are rendered unpatentable by Nakamoto even if read in view of Baker because, as set forth above, Nakamoto itself does not teach or suggest (i) the claimed process in which a material forms an adhesive contact with an electron field emitter, or (ii) an article characterized by improved emission as a result of either of those processes.

Baker's disclosure of carbon properties adds nothing to overcome the above stated deficiencies of Nakamoto because Baker does not teach or suggest the specific process steps that distinguish Claims 7 or 28 over Nakamoto.

In view of the distinctions between the pending claims and the disclosures of Nakamoto, Baker and a combination thereof, Applicant respectfully requests the Examiner to withdraw the 35 U.S.C. §103(a) rejection of Claims 7 and 28 over Nakamoto, Bower or a combination thereof.

VIII.

In Items 42-45, the Examiner has rejected Claim 12 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,057,637 ("Zettl").

Zettl discloses an electron beam field emission source prepared from a nanotube matrix in which the field emitter material is a binder and nanotubes suspended in the binder. The field emitter material can also be nanotube-rich material bound into a matrix without using a binder. In the latter case, nanotube-rich material is compacted in a simple pellet press (piston/cylinder device) to a pressure sufficient to have the nanotubes "stick" to each other and form a cohesive matrix.

Claim 12 is not rendered unpatentable by Zettl because it does not teach or suggest the claimed process in which a force is applied essentially normal to an electron field emitter such that the force fractures the electron field emitter such that a new surface thereof is formed.

Zettl is concerned with making a matrix of either nanotubes and a binder or nanotube-rich material itself. For example, at 5/56-60 nanotube-rich material is compacted in a

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piston/cylinder device to a pressure sufficient to have the nanotubes stick to each other and form a matrix. Although in the process of forming such a matrix, individual nanotubes may be fractured, this has no relation to applying a force to an electron field emitter. It is only after the matrix is formed by such compression in Zetl that it is attached to a substrate for eventual use as an emitter. Zetl is concerned with compaction, not a process to improve a surface.

Further, at 6/20~31, Zetl describes making a pixel by placing a binder/nanotube mixture between glass slides for curing. A crosswise strip is cut from the slide-matrix assembly, and the short end of the strip is then ground back to expose a square sample facet, which serves as the electron emission surface. While the action of cutting may apply a force to the slide-matrix assembly, that force does not form a new surface of an electron field emitter as required by Claim 12. The new surface of the pixel in Zetl is formed instead by grinding.

In view of the distinctions discussed above between Claim 12 and the disclosures of Zetl, Applicant respectfully requests the Examiner to withdraw the rejection of Claim 12 under 35 U.S.C. §103(a).

IX.

In Items 46~48, the Examiner has rejected Claim 59 under 35 U.S.C. §103(a) as being unpatentable over Zetl in view of Kim. Claim 59 is distinguishable over the combination of Zetl and Kim for the same reasons as set forth in Sections V and VIII (above), and Applicant therefore respectfully requests the Examiner to withdraw the rejection of Claim 59 under 35 U.S.C. §103(a).

X.

In Items 49~53, the Examiner has rejected Claims 77~80 under 35 U.S.C. §103(a) as being unpatentable over Nakamoto.

Claims 77~80 are not rendered unpatentable by Nakamoto because, as set forth above, Nakamoto itself does not teach or suggest (i) the underlying process in which a material forms an adhesive contact with an electron field emitter, or (ii) the underlying process in which a force is applied essentially normal to an electron field emitter.

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Nakamoto's disclosure of the use of a resin as the SRL does nothing to overcome these basic deficiencies of the reference.

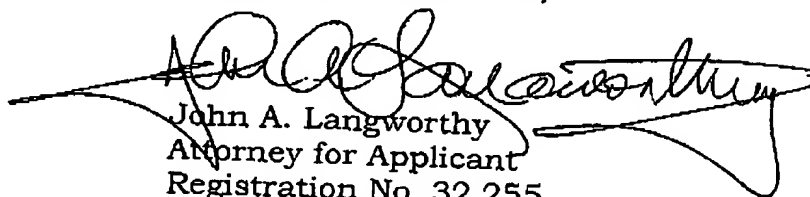
As a result, Applicant respectfully requests the Examiner to withdraw the rejection of Claims 77~80 under 35 U.S.C. §103(a).

XI.

Applicant renews its request for an interference with US 6,436,221 as set forth in its paper received by the U.S.P.T.O. on July 28, 2003.

In view of the foregoing, Applicant submits that all of the Examiner's objections and rejections have been properly traversed, and that the pending claims are in condition for allowance. Applicant respectfully requests that a notice of allowability of all pending claims be issued, and that the case be forwarded to the Board of Patent Appeals and Interferences with a favorable recommendation for the declaration of an interference with US 6,436,221.

Respectfully submitted,



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